OCT 1 2 1990

FLOOD INSURANCE STUDY

TOWN OF SMITHFIELD, VIRGINIA
ISLE OF WIGHT COUNTY

DECEMBER 5, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER 510081

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: December 5, 1990

Flood Insurance Study Revised:

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FLOOD INSURANCE STUDY
TOWN OF SMITHFIELD, ISLE OF WIGHT COUNTY, VIRGINIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Smithfield, Isle of Wight County, Virginia, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the Norfolk District of the U. S. Army Corps of Engineers (COE), for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-87-E-2509, Project Order No. 3, Amendment No. 1. This work was completed in May 1988.

1.3 Coordination

On June 16, 1986, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the town, and the COE (the study contractor) to determine the flooding sources to be studied by detailed methods. Contacts with various Federal and state agencies were made during the preparation of the study in order to minimize possible hydrologic and hydraulic conflicts. A search for basic data was made at all levels of government.

On May 19, 1989, a final CCO meeting was held with representatives of FEMA, the town, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Smithfield, Isle of Wight County, Virginia. The area of study is shown on the Vicinity Map (Figure 1).

Tidal flooding from the Pagan River and its adjoining estuaries was studied by detailed methods. The detailed study includes the effects of high-velocity wave action that accompanies severe storms such as hurricanes and northeasters. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through May 1993.

2.2 Community Description

The Town of Smithfield is located in Isle of Wight County, in southeast Virginia, approximately 15 miles north of Hampton Roads. It is bordered on all sides by the unincorporated areas of Isle of Wight County. The town encompasses approximately 6.3 square miles of land area and had a population of 3,713 in 1980 (Reference 1).

Development within the floodplains of Smithfield consists of scattered residences and businesses. Increased pressure for development of the floodplains can be expected with future development in the area.

The economy of the town is based primarily on the multimillion-dollar meat packing industry. Several large plants in the area produce bacon, sausage, lard, and nationally-known Smithfield hams.

The area has a temperate climate, with moderate seasonal changes, characterized by warm summers and cool winters. Temperatures average approximately 78 degrees Fahrenheit (^{o}F) during July, the warmest month, and 41^{o}F during January, the coolest month. Annual precipitation over the area averages approximately 45 inches per year (Reference 2). There is some variation in the monthly averages; however, this rainfall is distributed uniformly throughout the year. Snowfall is infrequent, generally occurring in light amounts and usually melting in a short period of time.

The town lies within the Coastal Plain province, an area underlain predominantly by sand, gravel, clay, and marl strata. Elevations within the town range from sea level to approximately 70 feet.

2.3 Principal Flood Problems

The areas along the shoreline of the Town of Smithfield are vulnerable to tidal flooding from major storms, commonly referred to as hurricanes and northeasters. Both storms produce winds that push large volumes of water against the shore.

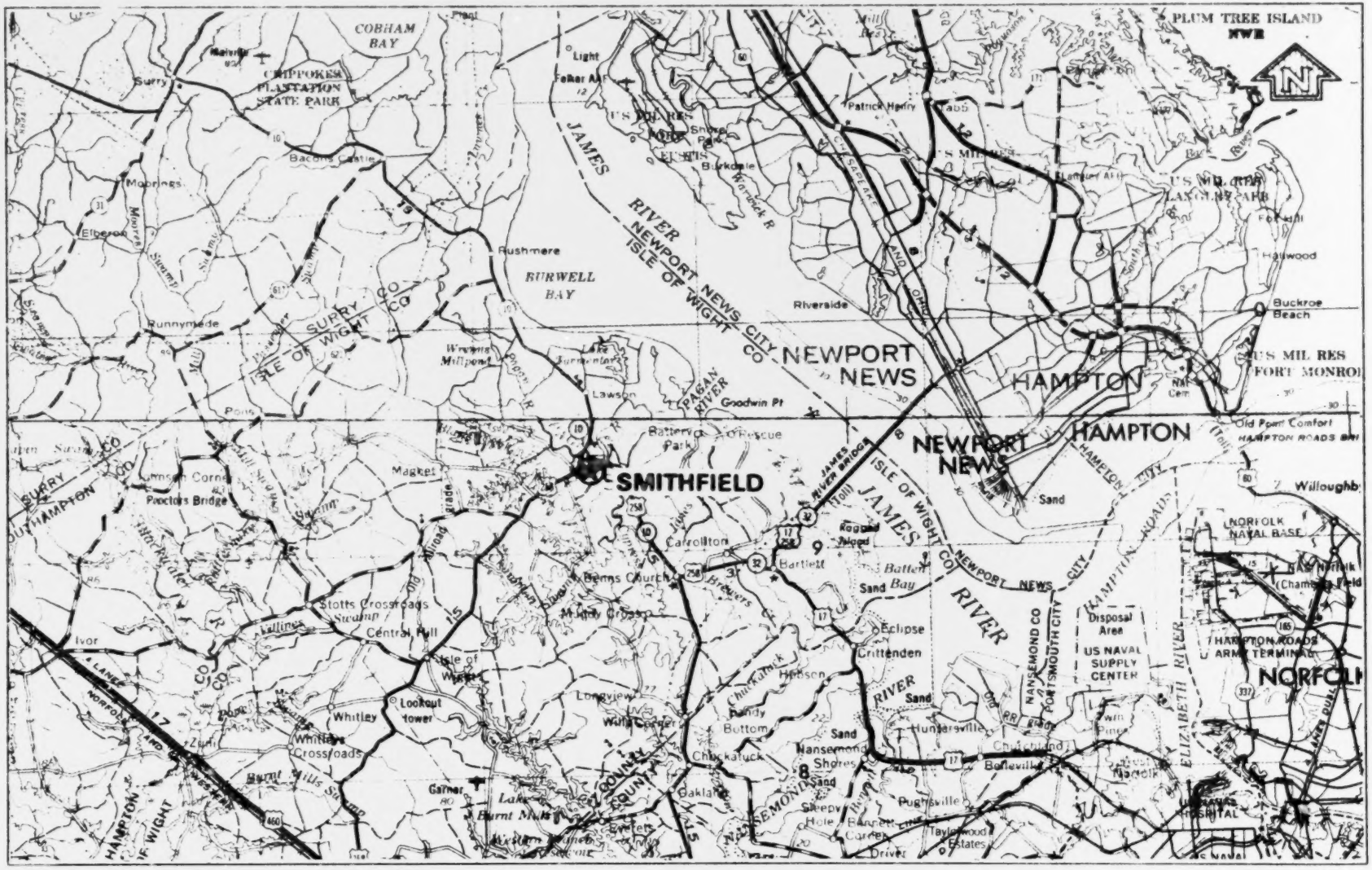

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF SMITHFIELD, VA

(ISLE OF WIGHT CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

Hurricanes, with their high winds and heavy rainfall, are the most severe storms to which the town is subjected. The term "hurricane" is applied to an intense cyclonic storm originating in tropical or subtropical latitudes in the Atlantic Ocean just north of the equator. While hurricanes may affect the area from May through November, nearly 80 percent occur during the months of August, September, and October with approximately 40 percent occurring during September. The most severe hurricane to strike the town occurred in August 1933.

Another type of storm that can cause severe damage to the town is the northeaster. This is also a cyclonic storm, and originates with little or no warning along the middle and northern Atlantic Coast. These storms occur most frequently in the winter months but may occur at any time. Accompanying winds are not of hurricane force, but are persistent, causing above-normal tides for long periods of time. The March 1962 northeaster was the most severe to ever hit the town.

The amount and extent of damage caused by any tidal flood will depend upon the topography of the area flooded, rate of rise in floodwaters, depth and duration of flooding, exposure to wave action, and the extent to which damageable property has been placed in the floodplain. The depth of flooding during these storms depends upon the velocity, direction, and duration of the wind; the size and depth of the body of water over which the wind is acting; and the astronomical tide. The duration of flooding depends upon the duration of the tide-producing forces. Floods caused by a hurricane are usually of a much shorter duration than the ones caused by a northeaster. Flooding from hurricanes rarely lasts more than one tidal cycle; however, flooding caused by northeasters may last several days, during which the most severe flooding takes place at the time of the peak astronomical tide.

The timing or coincidence of the maximum storm surge with the normal high tide is an important factor in the consideration of flooding from tidal sources. The mean range of tide in the Pagan River at Smithfield is 1.4 feet. The range of tide may be somewhat less in the connecting creeks and inlets (Reference 3).

The area also contains estuaries of the Pagan River that are subject to tidal flooding in their lower reaches but fluvial flooding on the upper reaches. Flooding on the upper reaches of these streams may be caused by heavy rains occurring at any time during the year. Flooding may also occur as a result of intense rainfall produced by local thunderstorms or tropical disturbances such as hurricanes, which move into the area from the Gulf or Atlantic coasts. The effects of riverine flooding are not addressed in this study.

The Town of Smithfield has experienced major storms since the early settlement of the area. Historical accounts of severe storms in the area date back several hundred years. The following paragraphs discuss some of the large storms that have occurred in recent history.

The hurricane of August 23, 1933 was one of the most severe storms that ever occurred in the Middle Atlantic region. This tropical hurricane passed inland near Cape Hatteras on August 22, passed slightly west of Norfolk, and continued towards the north accompanied by extreme high wind and tide. The storm surge in the bay and tidal estuaries was the highest of record and coincided with astronomical high tide. The water level reached a maximum of 8 feet in Hampton Roads (Reference 4).

Hurricane "Hazel," the second most destructive of recent hurricanes to strike the area, entered the mainland south of Wilmington, North Carolina, during the morning of October 15, 1954, and moved rapidly northward, passing over Norfolk and Fredericksburg in the early afternoon. The winds were from the east and southeast until the eye passed. When the eye passed, the winds shifted to the southwest with higher velocities. The hurricane surge was not as high as the August 1933 storm, although the tidal surge was superimposed on the normal high tide. In addition to damage by tidal flooding, much damage was caused to roofs, communication lines, and other structures by the high wind. Damage of this nature is characteristic of that to be expected during hurricanes (Reference 4).

The most recent flood of major proportions in the area occurred during the northeaster of March 6-8, 1962. Disastrous flooding and high waves occurred along the Atlantic seaboard from New York to Florida. This flood was unusual, even for a northeaster, since it was caused by a low pressure cell that moved from south to north past Hampton Roads and then reversed its course, moving again to the south and bringing with it huge volumes of water and high waves. The maximum flood height occurred on the morning of March 7 and reached 7.4 feet in Hampton Roads (Reference 5).

2.4 Flood Protection Measures

There are no existing flood control structures that would provide protection during major floods in the Town of Smithfield. There are several measures that have provided some protection against flooding. These include bulkheads and nonstructural measures for floodplain management, such as zoning codes. The "Uniform Statewide Building Code," which went into effect in September 1973, states, "where a structure is located in a 100-year flood plain, the lowest floor of all future construction or substantial improvement to an existing structure...must be built at or above that level, except for nonresidential structures which may be floodproofed to that level" (Reference 6).

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which

is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Analyses were carried out to establish the peak elevation-frequency relationships for each flooding source studied in detail affecting the community.

Tidal flood frequency elevations used in this study were taken from the Flood Insurance Study for the City of Norfolk (Reference 7).

The stillwater elevations for the 10-, 50-, 100-, 500-year floods have been determined for the flooding sources studied by detailed methods and are summarized in Table 1, "Summary of Stillwater Elevations."

TABLE 1 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
PAGAN RIVER AND ESTUARIES				
Entire shoreline within community	6.4	7.8	8.5	9.8

3.2 Hydraulic Analyses

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

Special consideration was given to the vulnerability of the Town of Smithfield to wave attack along the Pagan River shoreline during severe hurricanes and northeasters. Areas of shoreline subjected to

significant wave attack are referred to as coastal high hazard zones. Methods have been developed to determine which sections of a shoreline fall into this category (Reference 8). The factors considered for such a determination include: choice of a suitable fetch, its length and width, sustained wind velocities, coastal water depths, and physical features of the shoreline that would appreciably affect wave propagation. All of these factors are analyzed to determine if a wave with a height of 3 feet could be generated. The 3-foot wave has been determined to be the minimum size wave capable of causing major damage to conventional wood-frame or brick veneer structures. This criterion has been adopted by FEMA for the determination of V zones.

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in the NAS report (Reference 9). This method is based on three major concepts. First, depth-limited waves in shallow water reach a maximum breaking height equal to 0.78 times the stillwater depth, and the wave crest is 70 percent of the total wave height above the stillwater level. Second, the wave height may be diminished by dissipation of energy due to the presence of obstructions such as sand dunes, dikes, seawalls, buildings and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures developed by FEMA (Reference 10). Third, wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

These concepts and equations were used to compute wave envelope elevations associated with the 100-year storm surge. Accurate topographic land-use and land-cover data are required for the coastal analyses, and were obtained from field surveys.

Wave heights were computed along transects that were located perpendicular to the average mean shoreline. The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, the transects were spaced at larger intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects. Table 2, "Transect Descriptions," provides a listing of the transect locations and stillwater elevations, as well as the initial wave crest elevations. Figure 2, "Transect Location Map," illustrates the location of the transects for the community.

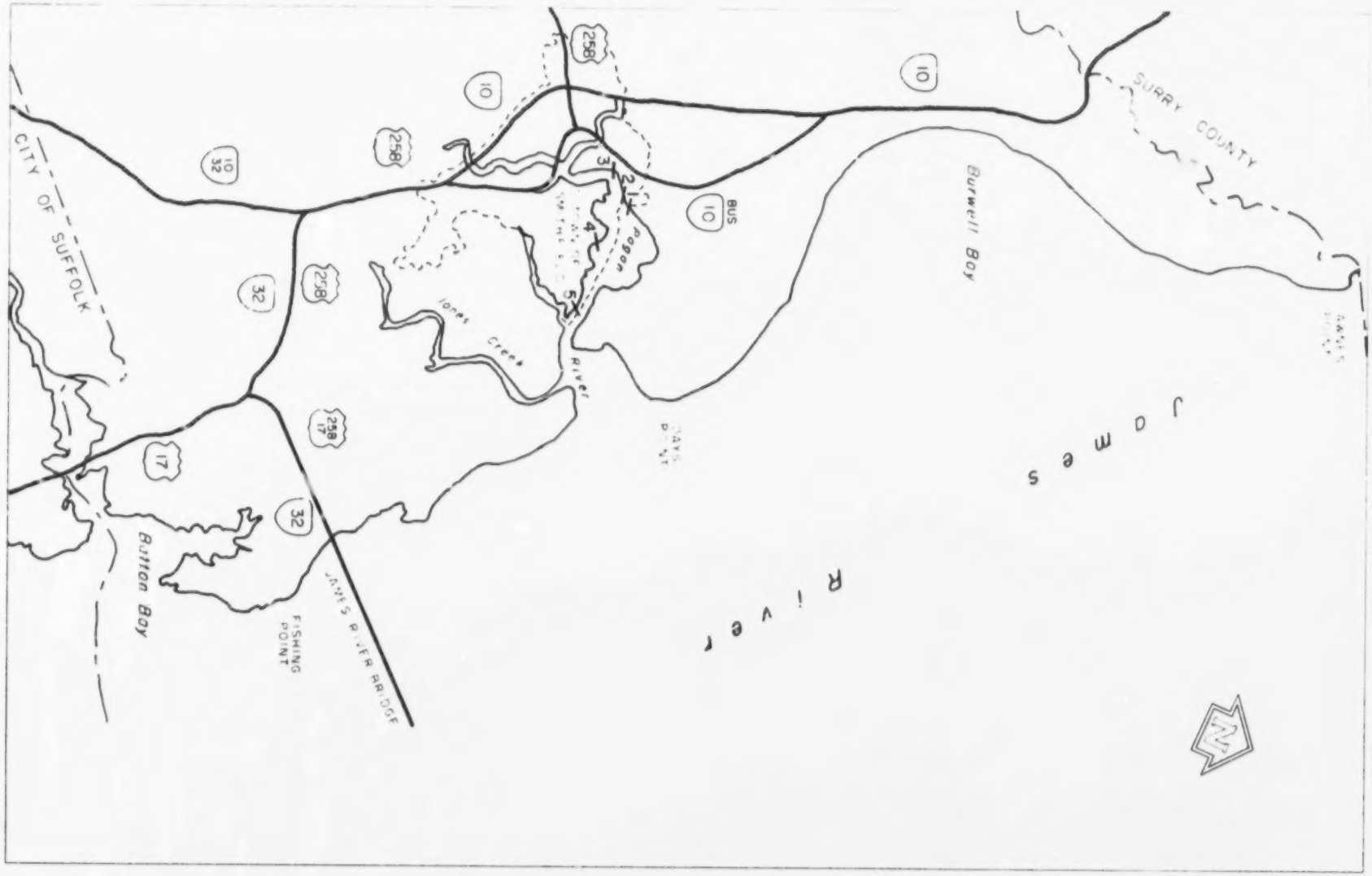

FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF SMITHFIELD, VA.

(Isle Of Wight CO., Va.)

APPROXIMATE SCALE

2 0 2 4 6 Miles

TRANSECT LOCATION MAP

TABLE 2 - TRANSECT DESCRIPTIONS

Transect	Location	Elevation (Feet NGVD) Stillwater 100-year	Maximum Wave Crest 100-Year [1]
No. 1	From the northern corporate limits to a point approximately 800 feet southwest of northern corporate limits	8.5	12
No. 2	From a point approximately 800 feet southwest of the northern corporate limits to Berry Hill Road, extended	8.5	12
No. 3	From Berry Hill Road, extended, to the confluence of Cypress Creek	8.5	12
No. 4	From the confluence of Cypress Creek to Azalea Drive, extended	8.5	12
No. 5	From Azalea Drive, extended, to the confluence of Morris Creek	8.5	12

[1]Due to map scale limitations, the maximum wave elevation may not be shown on the Flood Insurance Rate Map

Along each transect, wave envelope elevations were computed considering the combined effects of changes in topography, vegetation, and physical features. Between transects, elevations were interpolated using the topographic, land-use and land-cover data, as well as engineering judgment to determine the areal extent of flooding. The results of these calculations are accurate until local topography, vegetation, or cultural development within the community undergoes any major changes. The results of this analysis are summarized in Table 3, "Transect Data".

TABLE 3 - TRANSECT DATA

Flooding Source	Stillwater Elevation 10-Year	50-Year	100-Year	500-Year	Zone	Base Flood Elevation (Feet NGVD)*
PAGAN RIVER AND ESTUARIES						
Transect 1	6.4	7.8	8.5	9.8	VE	11-12
					AE	9-10
Transect 2	6.4	7.8	8.5	9.8	VE	11-12
					AE	9-10
Transect 3	6.4	7.8	8.5	9.8	VE	11-12
					AE	9-10

*Due to map scale limitations, Base Flood Elevations shown on the Flood Insurance Rate Map represent average elevations for the zones depicted

TABLE 3 - TRANSECT DATA - continued

Flooding Source	Stillwater Elevation 10-Year	50-Year	100-Year	500-Year	Zone	Base Flood Elevation (Feet NGVD)*
PAGAN RIVER AND ESTUARIES (continued)						
Transect 4	6.4	7.8	8.5	9.8	VE	11-12
					AE	9-10
Transect 5	6.4	7.8	8.5	9.8	VE	11-12
					AE	9-10

*Due to map scale limitations, Base Flood Elevations shown on the Flood Insurance Rate Map represent average elevations for the zones depicted

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the Flood Insurance Rate Map (Exhibit 1); the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 2).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the flooding sources studied in detail, the 100- and 500-year floodplain boundaries have been delineated using topographic maps at a scale of 1:24,000 with contour intervals of 5 and 10 feet (Reference 11).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 1). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zone AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study is currently being prepared for the unincorporated areas of Isle of Wight County (Reference 12). The results of that study will be in exact agreement with the results of this study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Virginia, Washington, D. C., U. S. Government Printing Office, 1981.

2. Commonwealth of Virginia, Division of State Planning and Community Affairs, Data Summary-Isle of Wight County, Richmond, Virginia, May 1971.

3. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Tide Tables 1988, High and Low Water Predictions, East Coast of North and South America Including Greenland, Washington, D. C., 1987.

4. U. S. Army Corps of Engineers, House Document 354, 87th Congress, 2nd Session, Norfolk, Virginia-Interim Hurricane Survey, 1962.

5. U. S. Army Corps of Engineers, Norfolk District, March 1962 Storm on the Coast of Virginia, Norfolk, Virginia, August 10, 1962.

6. Commonwealth of Virginia, Virginia Uniform Statewide Building Code, Article 8, Part C, Section 872.6, September 1973.

7. Federal Emergency Management Agency, Flood Insurance Study, City of Norfolk, Independent City, Virginia, Washington, D. C., April 17, 1984.

8. U. S. Army Corps of Engineers, Galveston District, General Guidelines for Identifying Coastal High Hazard Zones, Galveston, Texas, 1975.

9. National Academy of Sciences, Methodology for Calculating Wave Action Effects Associated with Storm Surges, Washington, D. C., 1977.

10. Federal Emergency Management Agency, User's Manual for Wave Height Analysis, Washington, D. C., Revised February 1981.

11. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Intervals 5 and 10 Feet: Mulberry Island, Virginia, 1965, Photorevised 1979; Smithfield, Virginia, 1968, Photorevised 1980; Benns Church, Virginia, 1965, Photorevised 1979.

12. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Isle of Wight County, Virginia (Unpublished).

EXHIBIT 2 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	12.041	USGS disk, stamped PRIM TRAV STA NO 299 (A) 12', located along Commerce Street approximately 250 feet northeast of traffic light at junction of Commerce Street and Church Street (Business Route 10), set in north corner of building occupied by shoe repair shop, and approximately 3.5 feet above sidewalk.